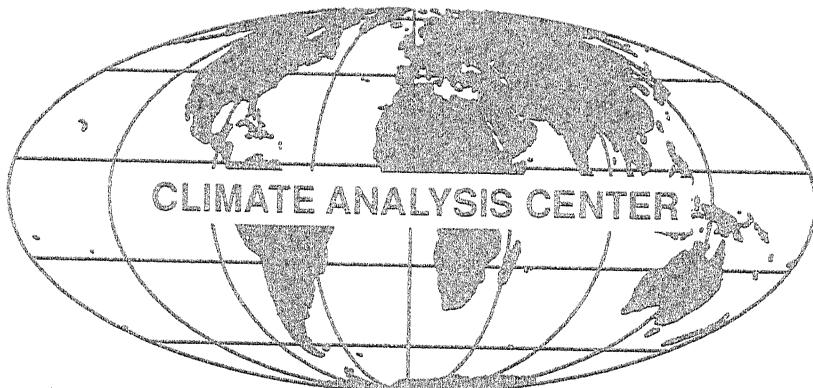


CONTAINS:  
SEPTEMBER  
1993 GLOBAL  
CLIMATE  
ANOMALIES

CONTAINS:  
ENSO  
ADVISORY 93/9



CONTAINS:  
SEPTEMBER  
1993 UNITED  
STATES  
CLIMATE  
SUMMARY

# WEEKLY CLIMATE BULLETIN

No. 93/42

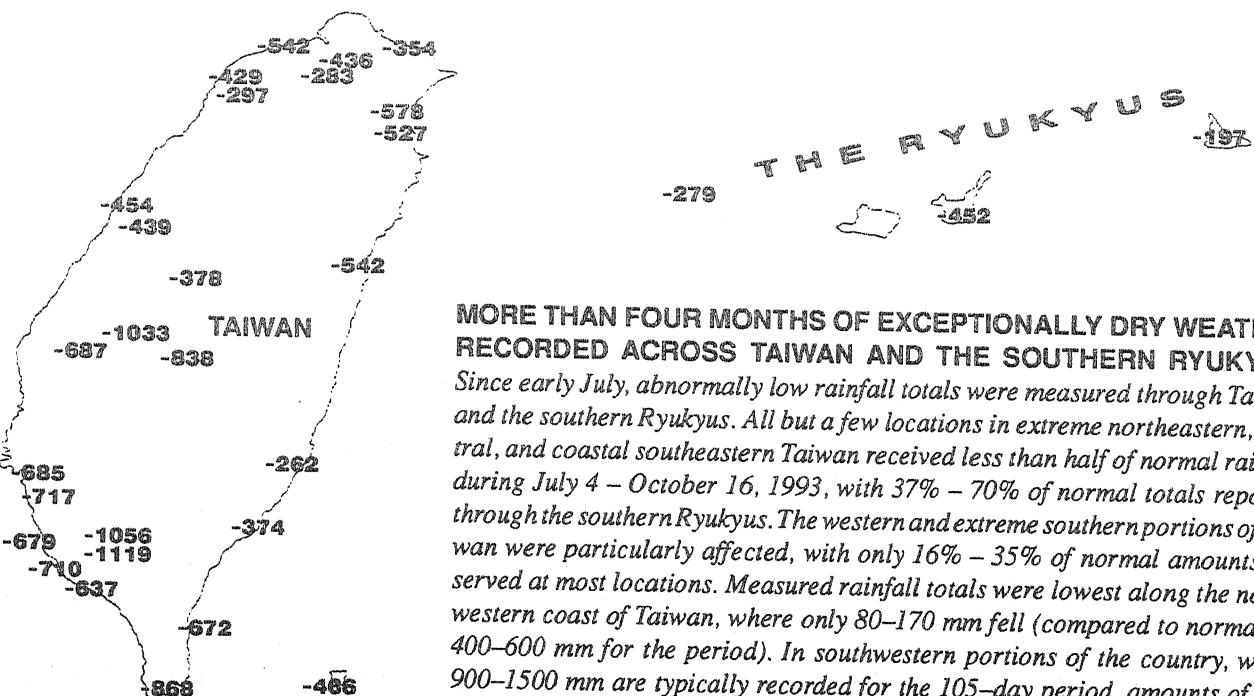
Washington, DC

October 20, 1993

## DEPARTURE FROM NORMAL PRECIPITATION (mm)

July 4 – October 16, 1993 [105 days]

-311



**MORE THAN FOUR MONTHS OF EXCEPTIONALLY DRY WEATHER RECORDED ACROSS TAIWAN AND THE SOUTHERN RYUKYUS.** Since early July, abnormally low rainfall totals were measured through Taiwan and the southern Ryukyu. All but a few locations in extreme northeastern, central, and coastal southeastern Taiwan received less than half of normal rainfall during July 4 – October 16, 1993, with 37% – 70% of normal totals reported through the southern Ryukyu. The western and extreme southern portions of Taiwan were particularly affected, with only 16% – 35% of normal amounts observed at most locations. Measured rainfall totals were lowest along the northwestern coast of Taiwan, where only 80–170 mm fell (compared to normals of 400–600 mm for the period). In southwestern portions of the country, where 900–1500 mm are typically recorded for the 105-day period, amounts of only 290–410 mm were measured. Amounts exceeding 600 mm were restricted to southeastern sections of the country while, farther east, between 270 and 465 mm of rain dampened the Ryukyu. According to press reports, the prolonged dry spell has affected crops throughout the region.

CLIMATE ANALYSIS CENTER, NOAA

Stations required at least 94 days (90%) for inclusion.



UNITED STATES DEPARTMENT OF COMMERCE  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
NATIONAL WEATHER SERVICE-NATIONAL METEOROLOGICAL CENTER  
**CLIMATE ANALYSIS CENTER**



# WEEKLY CLIMATE BULLETIN

This Bulletin is issued weekly by the Climate Analysis Center and is designed to indicate, in a brief concise format, current surface climatic conditions in the United States and around the world. The Bulletin contains:

- Highlights of major climatic events and anomalies.
- U.S. climatic conditions for the previous week.
- U.S. apparent temperatures (summer) or wind chill (winter).
- Global two-week temperature anomalies.
- Global four-week precipitation anomalies.
- Global monthly temperature and precipitation anomalies.
- Global three-month precipitation anomalies (once a month).
- Global three-month temperature anomalies (once a month).
- Global twelve-month precipitation anomalies (every three months).
- Global twelve-month temperature anomalies (every three months).
- Special climate summaries, explanations, etc. (as appropriate).

Most analyses contained in this Bulletin are based on preliminary, unchecked data received at the Climate Analysis Center via the Global Telecommunications System. Similar analyses based on final, checked data are likely to differ to some extent from those presented here.

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# GLOBAL CLIMATE HIGHLIGHTS

MAJOR CLIMATIC EVENTS AND ANOMALIES AS OF OCTOBER 16, 1993

1. Alaska:

### WET WEATHER PREVAILS.

Up to 110 mm of precipitation drenched southern sections of the state, where six-week moisture surpluses remained as high as 225 mm [7 weeks].

2. West-Central North America:

### MODERATE PRECIPITATION FALLS ON SOUTHERN SECTIONS; DRY ELSEWHERE.

Between 30 and 60 mm of precipitation fell on parts of northern California, western Oregon, and western Washington. Further north, less than 30 mm of rain was observed as a slow start to the wet season continued. Since early September, precipitation shortfalls approached 300 mm in British Columbia and 190 mm in Washington [8 weeks].

3. Central Gulf Coast:

### SHOWERS BRING LIMITED RELIEF.

Scattered showers dropped as much as 70 mm of rain on some locations, but many areas received less than 20 mm, and six-week moisture deficits reached 160 mm in parts of Texas and Florida [16 weeks].

4. Bolivia:

### TEMPERATURES MODERATE.

Near normal conditions returned to the country, except at isolated locations where weekly departures reached  $-4^{\circ}\text{C}$  [Ended at 9 weeks].

5. Central and Southern South America:

### WARM WEATHER AGGRAVATES DRYNESS.

Unusually warm conditions spread across much of Argentina, Uruguay, and extreme southern Brazil, with temperatures averaging as much as  $8^{\circ}\text{C}$  above normal [WARM - 4 weeks]. Although northern Uruguay and extreme southern Brazil received up to 60 mm of rain, most of the region observed less than 20 mm [DRY - 16 weeks].

6. Europe:

### EXCESSIVE PRECIPITATION CONTINUES.

Moderate precipitation (20 mm to 70 mm) exacerbated flooding in England, France, and Italy. Six-week moisture excesses soared to 700 mm in the Alps, and surpluses of 300 mm were common elsewhere. More rain fell on Heathrow Airport near London within two days than is typically measured during the entire month of October. According to press reports, the Rhone River in southern France rose to its highest level in decades as flooding continued to plague portions of southeastern Great Britain, southern France, northern Italy, and the Swiss Alps [6 weeks].

7. Russia and the Ukraine:

### COLD SPELL ENDS ABRUPTLY.

A sudden change in the weather, with weekly temperatures averaging as much as  $8^{\circ}\text{C}$  above normal, brought an abrupt end to the recent cold snap [Ended at 9 weeks].

8. Southern Japan:

### DRY WEATHER PROVIDES RELIEF FROM THE LENGTHY WET SPELL.

Little or no rain was reported as six-week moisture surpluses dropped to 150 mm or less at most locations [Ending at 18 weeks].

9. Taiwan and the Southern Ryukyus:

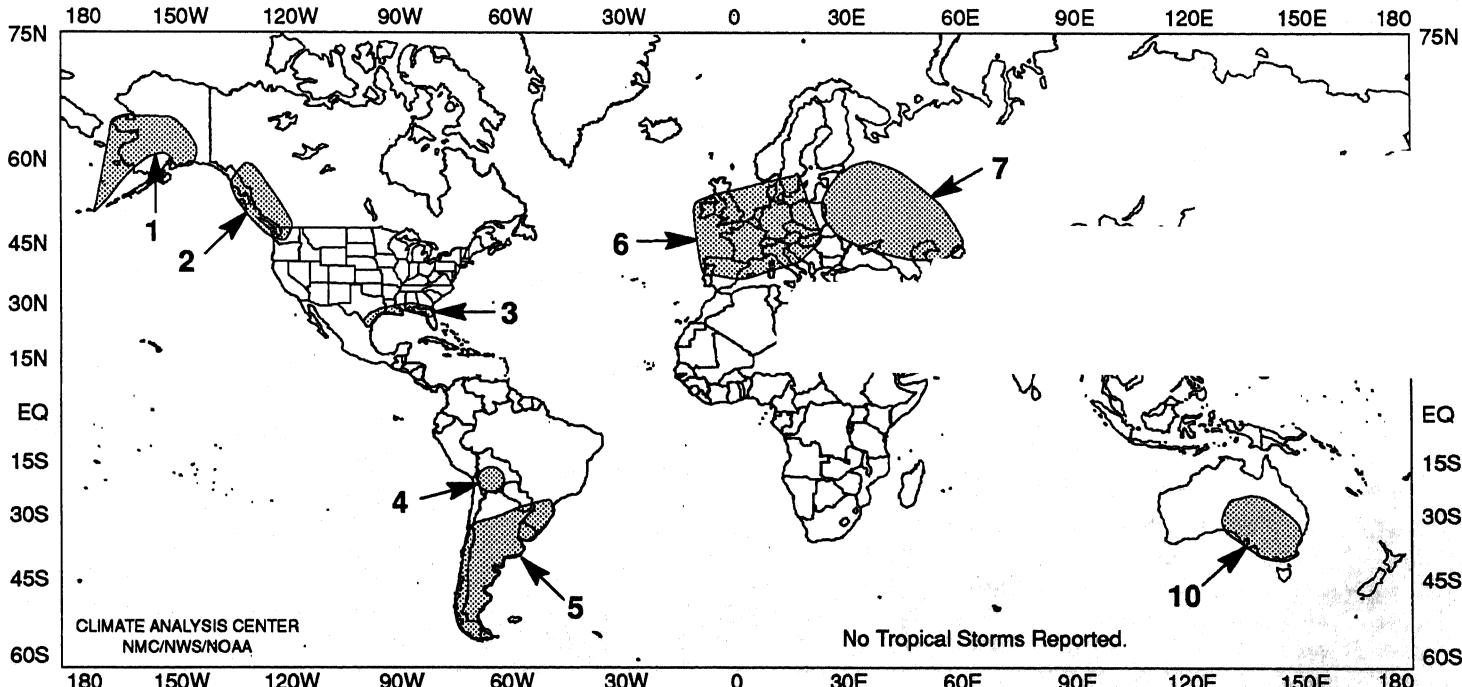
### STILL ABNORMALLY DRY.

Isolated heavy showers dumped 70 mm to 150 mm of rain on some areas, but most locations received less than 40 mm of rain, and six-week precipitation shortfalls lingered around 300 mm [18 weeks].

10. South-Central and Southeastern Australia:

### WET WEATHER EASES.

Most areas received less than 20 mm of rain, though isolated locations were soaked by 30 mm to 50 mm. Moisture surpluses since early September ranged from 50 mm to 110 mm across the region [7 weeks].

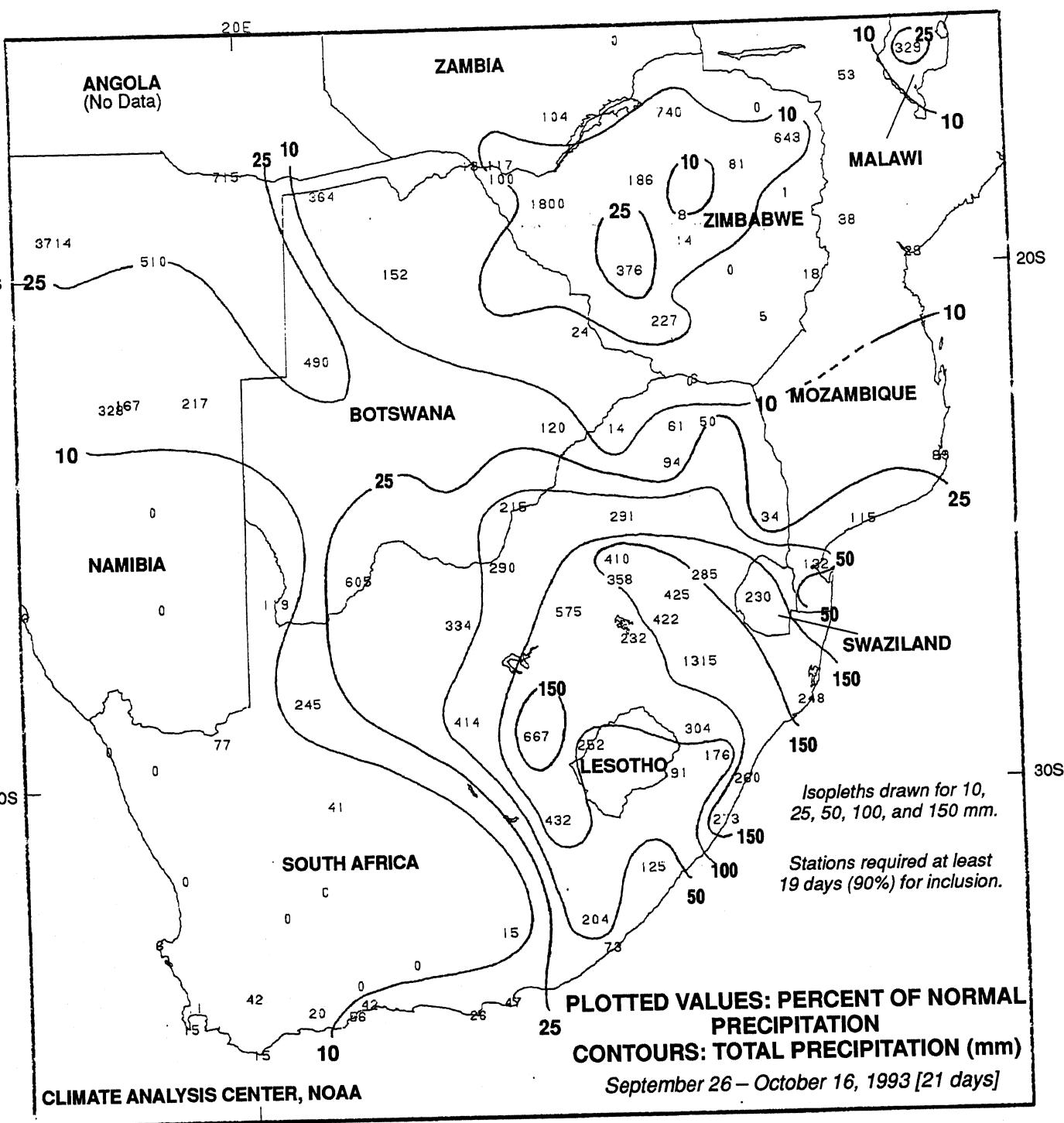


### EXPLANATION

TEXT: Approximate duration of anomalies is in brackets. Precipitation amounts and temperature departures are this week's values.

MAP: Approximate locations of major anomalies and episodic events are shown. See other maps in this Bulletin for current two week temperature anomalies, four week precipitation anomalies, long-term anomalies, and other details.

# GLOBAL CLIMATE HIGHLIGHTS FEATURE



**EARLY WET-SEASON RAINS REPORTED THROUGH LARGE SECTIONS OF SOUTHERN AFRICA.** Typically, very light rains are just beginning to dot most of southern Africa as the first half of the Southern Hemisphere spring progresses (except along the southern coastline, where rainfall is not normally as season-dependent). The last three weeks, however, brought moderate to heavy rains to large portions of the region unusually early in the wet season. Since late September, over 25 mm of rain fell on northern Namibia, western and southern Botswana, the eastern half of South Africa (except the northern and eastern Transvaal), Lesotho, Swaziland, southern Mozambique, central Zimbabwe, and southern Malawi. Exceptionally large totals of 100 – 175 mm were recorded through central and east-central South Africa, which represents between three and fourteen times the normal amount for the 21-day period. In addition, relatively low totals of 10–50 mm represented between five and 38 times the normal across northern Namibia, southern and western Botswana, and western Zimbabwe, where normals are small in early spring. In sharp contrast, subnormal rains were reported through most of Mozambique, southeastern Zimbabwe, the northern and eastern Transvaal, southwestern South Africa, and southern Namibia (although normals are close to zero in the latter two areas).

# UNITED STATES WEEKLY CLIMATE HIGHLIGHTS

## FOR THE WEEK OF OCTOBER 10 - 16, 1993

During the first part of the week, intense thunderstorms erupted ahead of a strong cold front that plunged southward into the central United States, spreading moderate to heavy rain across the southeastern Plains and the lower Mississippi Valley and spawning severe weather over northeastern Texas. On Tuesday evening, tornadoes damaged or destroyed ten homes in Duster, TX (about 70 miles southwest of Fort Worth) while straight-line winds damaged more buildings, uprooted trees, and downed power lines in Brady, TX, according to press reports. In addition, three inches of rain inundated areas to the northwest of Fort Worth in one hour, flooding some streets and homes. During the latter part of the week, a second cold front pushed southward out of Canada, generating moderate to heavy rains in portions of the middle Missouri, middle Mississippi, and lower Ohio Valleys. At week's end, violent thunderstorms raked eastern Kansas and northwestern Arkansas, with high wind gusts, large hail, and heavy rains of three inches or more. Farther west, a Pacific storm brought the season's first significant precipitation to northern California, where over four inches of rain drenched parts of the northern Sierra Nevadas.

At the beginning of the week, showers were scattered across the middle and southern Atlantic Coast states along an eastward-moving cold front while a Pacific Ocean storm system spread scattered rain over the western seaboard, with heavy amounts falling on northern California. Elsewhere, a large high pressure system brought clear skies and fair weather to much of the remainder of the country. On Monday, a second cold front moved southeastward out of Canada into the northern Plains and upper Mississippi Valley as the first front continued eastward into the Atlantic. Cold air settled over the northeastern states, where nine daily low temperature records were set as an upper level disturbance caused scattered rain from the middle Mississippi Valley to the middle Atlantic coast. Farther west, the Pacific storm spread more scattered precipitation across the Far West and into the Great Basin. By Tuesday evening, the southeastward-moving cold front reached from the northern portions of the southern Plains to the lower Great Lakes. Showers and severe thunderstorms developed to the south of the front in Oklahoma and the eastern half of Texas, and to the east of the front in the Northeast and mid-Atlantic. Showers were also scattered over the northern Pacific seaboard and northern and central Rockies, with snow reported in the higher elevations.

At mid-week, the southeastward-moving cold front dissipated after producing more showers and thunderstorms

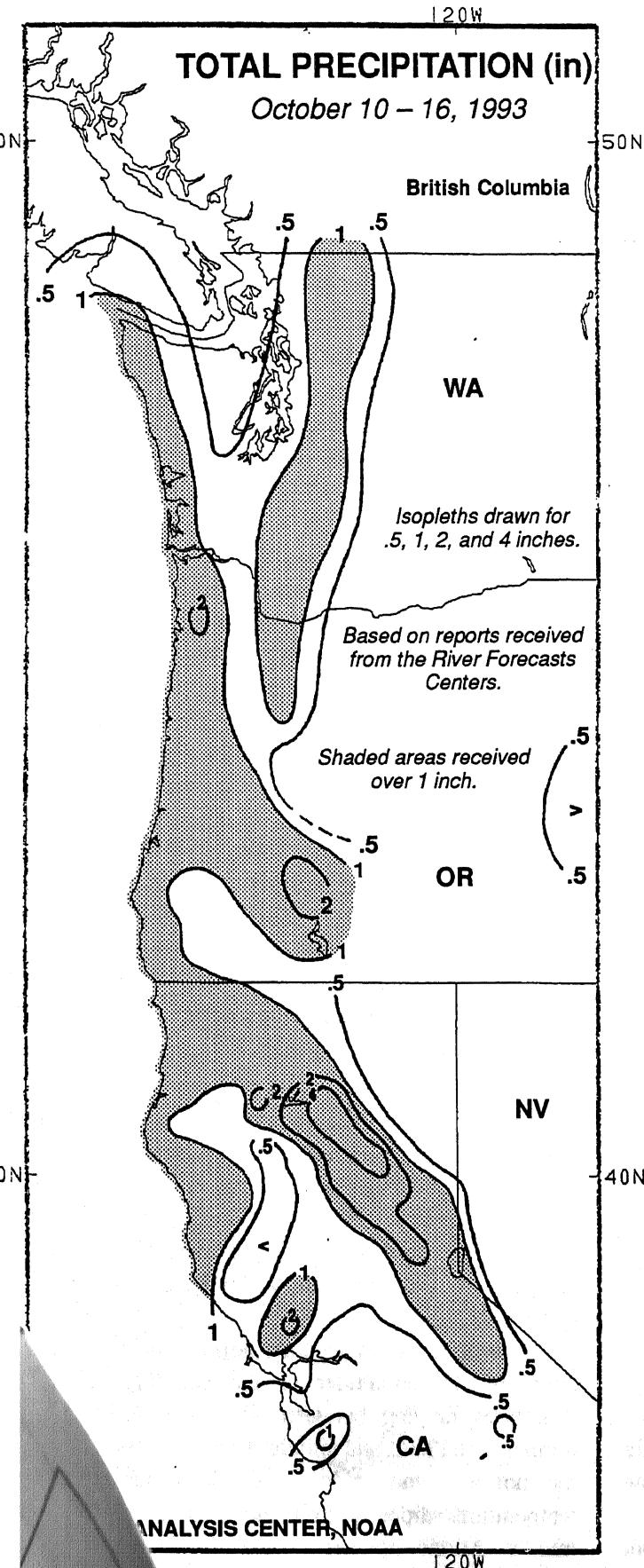
across eastern Texas, the lower Mississippi Valley, the central and southern Appalachians, and the northern Atlantic coast. Rain was also scattered through the central and northern Plains, ahead of yet another cold front moving southeastward out of Canada, and widely scattered over the Pacific Northwest. Cold air again surged into the northeastern states as nearly a dozen record lows were established from northern Indiana to southern New England on Thursday morning. During the latter part of the week, the latest cold front pushed across the Great Lakes, the middle and upper Mississippi Valley, and the central and southern Great Plains, generating widespread showers and thunderstorms, with locally heavy amounts. Showers and thunderstorms also soaked the Ohio Valley and Southeast ahead of the front while showers continued to dot the Far West and Intermountain West.

According to the River Forecast Centers, the greatest weekly precipitation totals (between two and seven inches) fell over portions of the southeastern Plains, the central Gulf Coast, the central Corn Belt, the northern mid-Atlantic Coast, eastern Kansas, southern Florida, eastern Kentucky, and northern California. In addition, scattered totals exceeding two inches were reported across southern New England, the Pacific Northwest, the south-central coast of Alaska, and the remainders of the middle and lower Mississippi Valley and the Southeast. Light to moderate amounts were measured in the northern and central Rockies, the Intermountain West, the northern Plains, eastern and western Hawaii, and the remainders of the Far West, central Plains, Alaska, and the eastern half of the nation. Little or no precipitation was reported in the southern Rockies, southern High Plains, and central Hawaii.

Warmer than normal conditions prevailed over the western quarter of the nation, the southern Rockies, the Rio Grande Valley, and southern Florida, with weekly departures of  $+5^{\circ}\text{F}$  to  $+7^{\circ}\text{F}$  measured in portions of the Rio Grande Valley. Abnormally warm weather again covered Alaska, with weekly departures reaching  $+12^{\circ}\text{F}$  at Northway.

Temperatures averaged near to slightly above normal across

# NORTH AMERICAN CLIMATE HIGHLIGHTS FEATURE

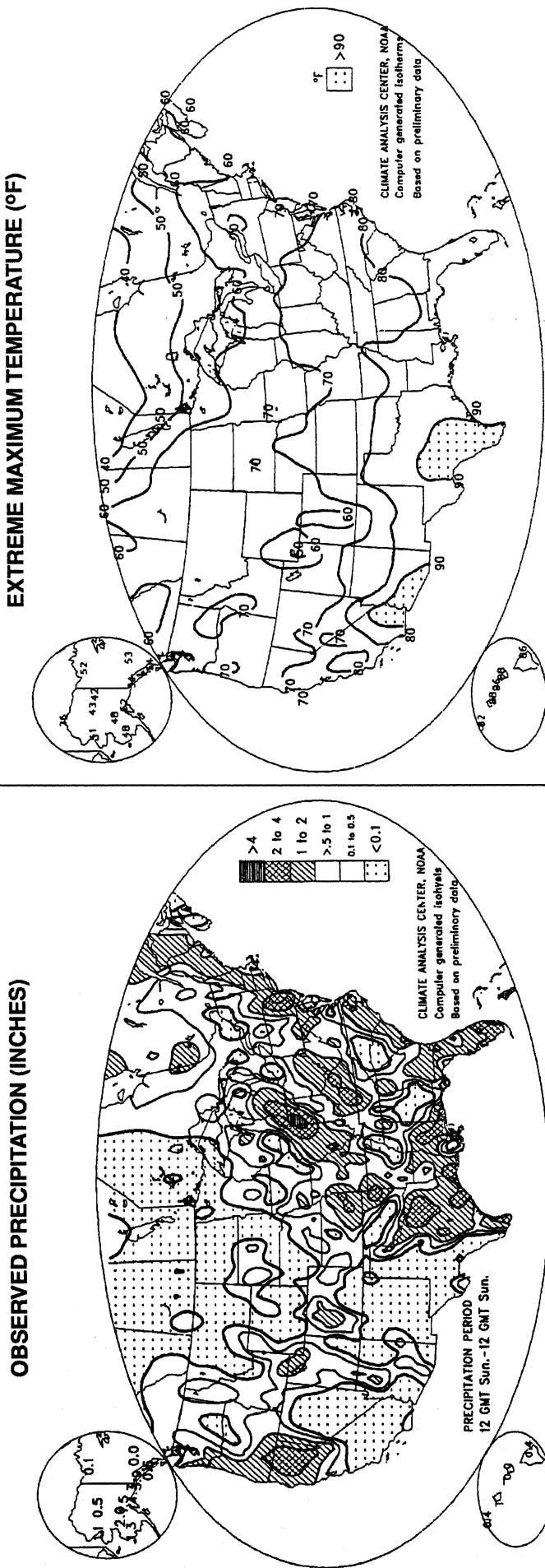


## THE FIRST WEEK OF MODERATE TO HEAVY PRECIPITATION DURING THE 1993-1994 WET SEASON OBSERVED ACROSS THE FAR WEST.

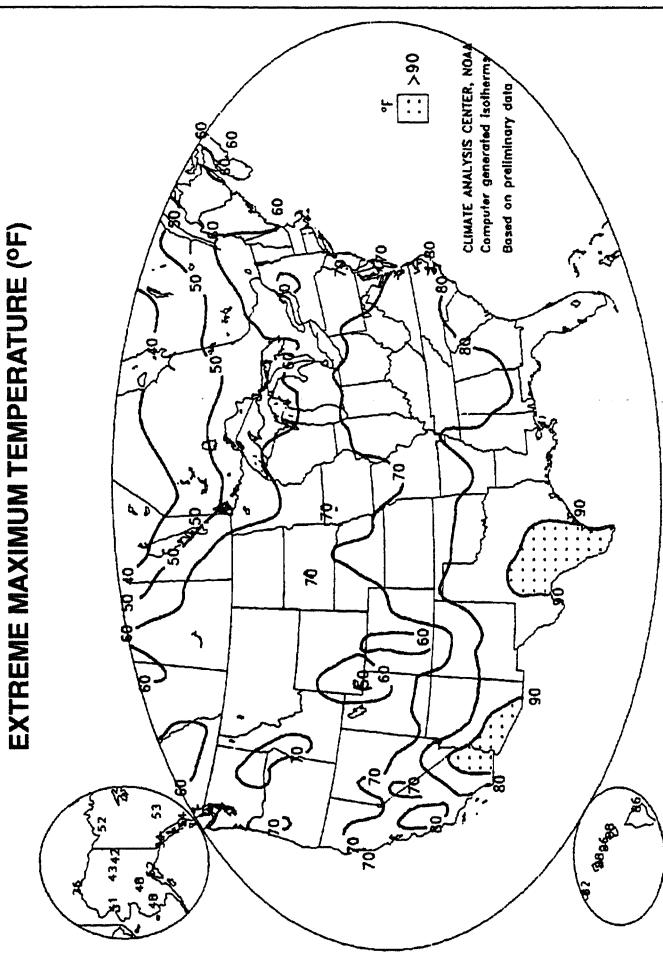
Following several weeks of subnormal precipitation through southwestern Canada, the Pacific Northwest, and northern California, moderate to heavy precipitation (exceeding one inch in most areas) was reported across western Washington, western Oregon, and northern California. The largest totals were recorded across the northern Sierra Nevadas in northern California, where over four inches of precipitation fell. Daily totals reached 2.92 inches at Humbug Summit, CA. This precipitation reduced, but did not alleviate, the moisture deficits that accumulated during the last few weeks through northern California and the Pacific Northwest. Farther north, however, another week with little or no precipitation was reported across southwestern Canada, allowing precipitation shortages to continue increasing.

# UNITED STATES WEEKLY CLIMATE CONDITIONS (October 10 – 16, 1993)

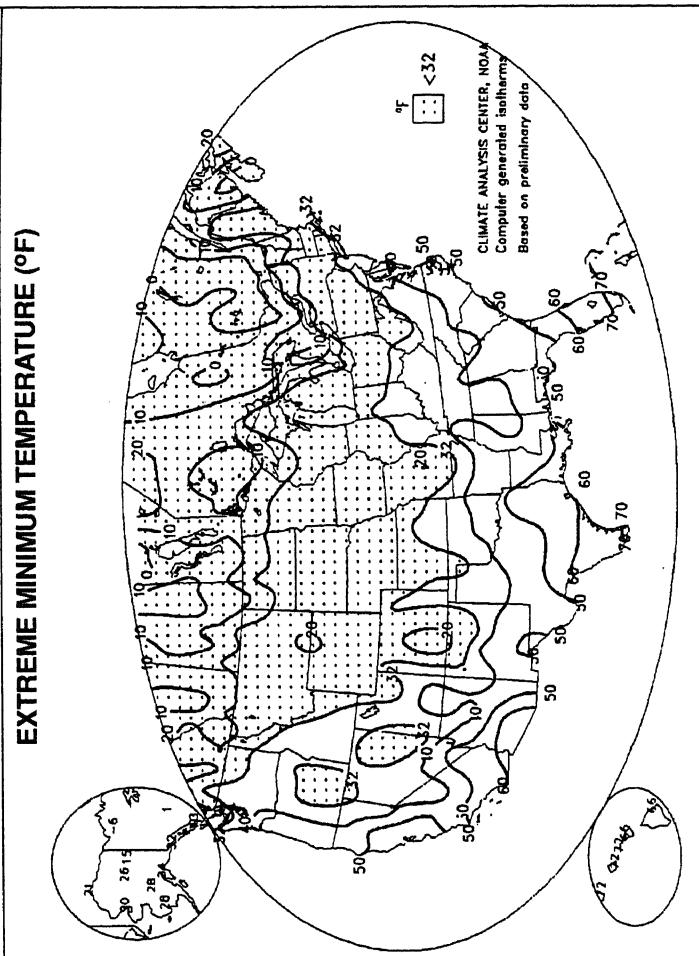
## OBSERVED PRECIPITATION (INCHES)



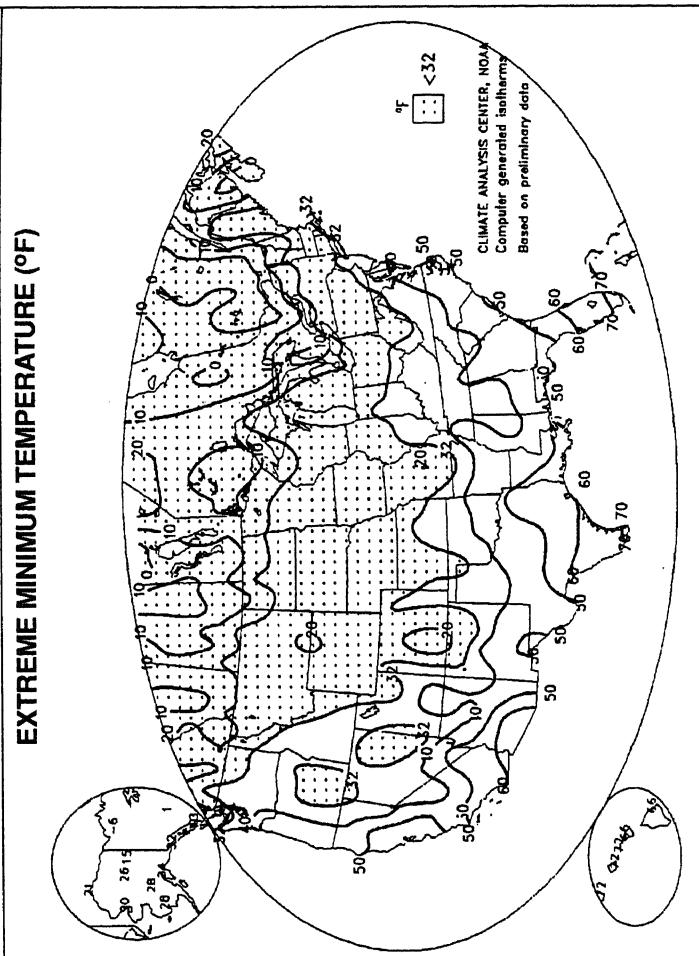
## EXTREME MAXIMUM TEMPERATURE (°F)



## DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F)

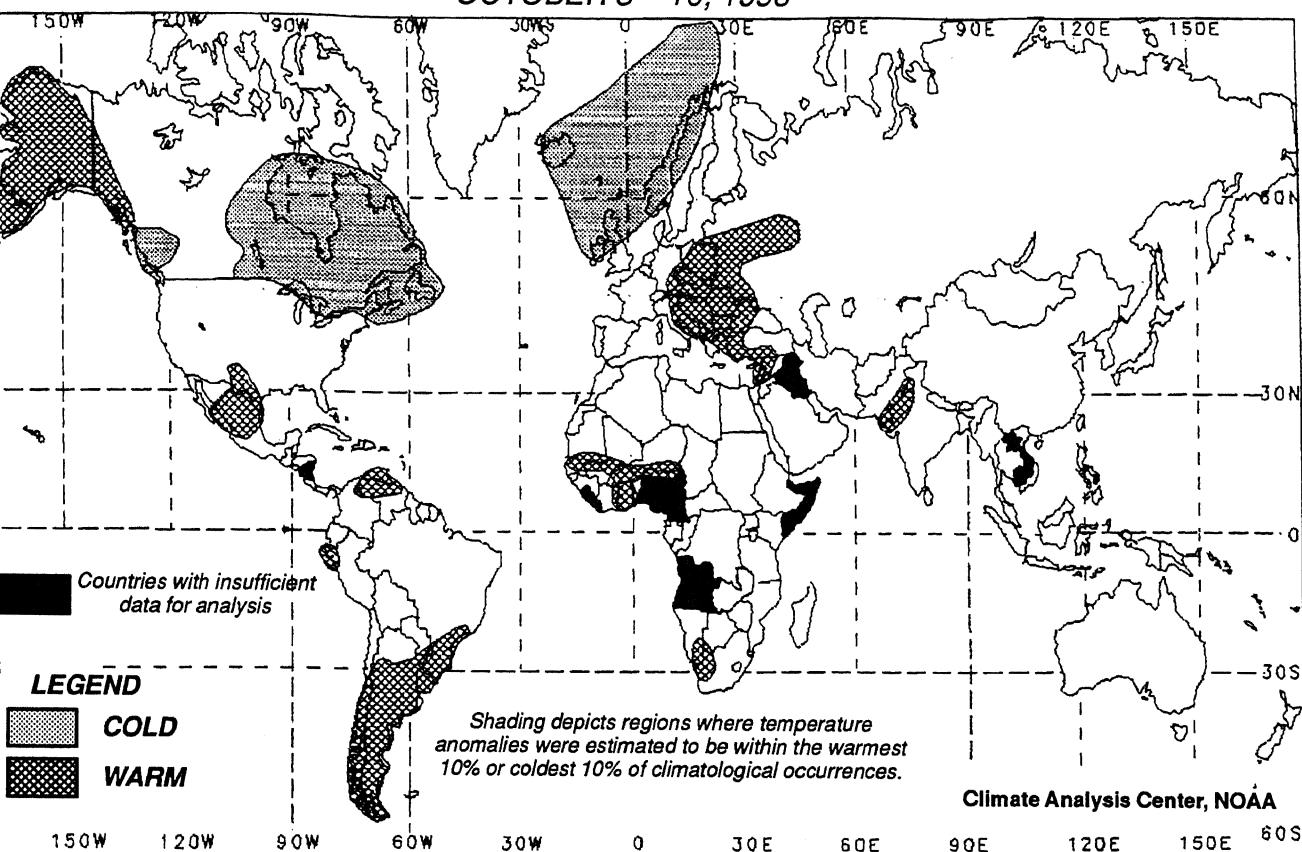


## EXTREME MINIMUM TEMPERATURE (°F)



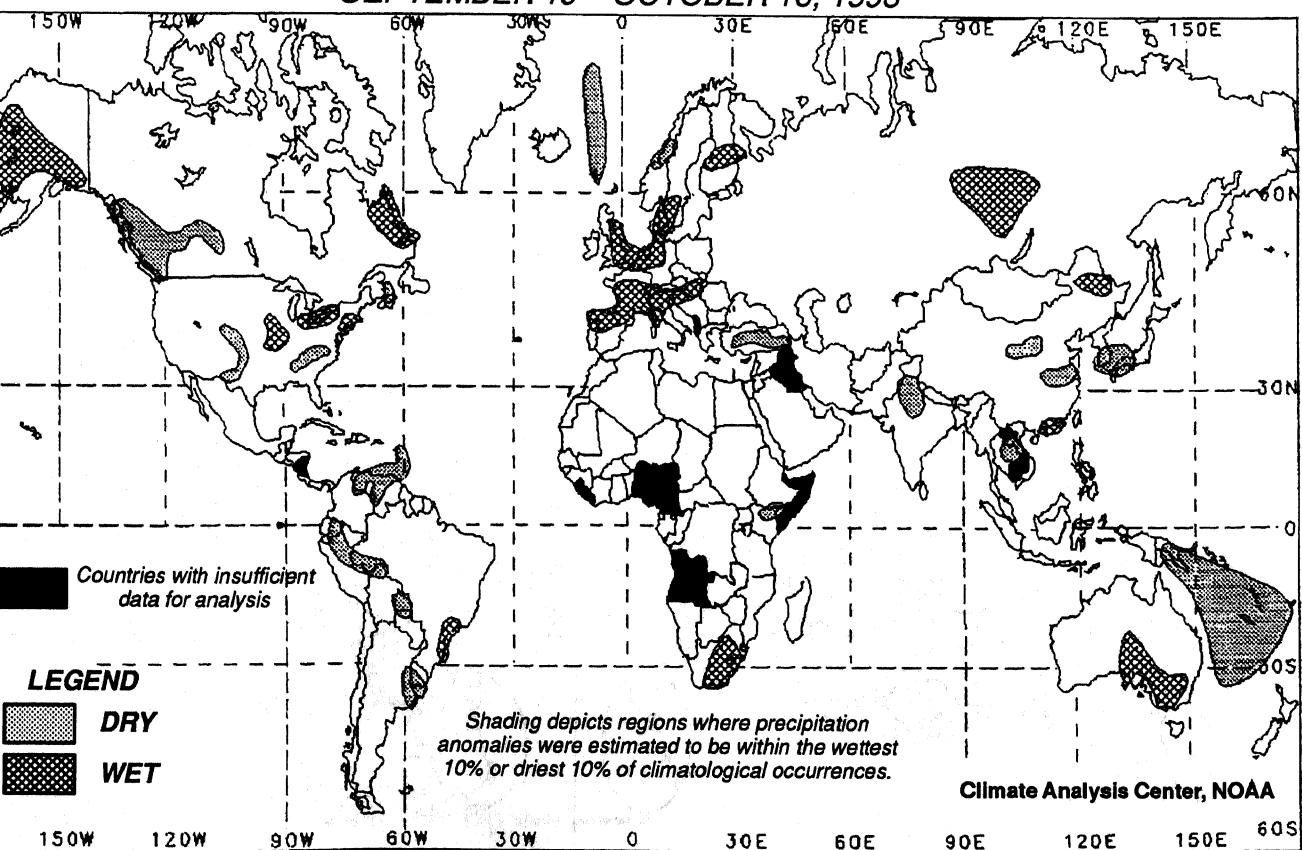
## TWO-WEEK GLOBAL TEMPERATURE ANOMALIES

OCTOBER 3 – 16, 1993



## FOUR-WEEK GLOBAL PRECIPITATION ANOMALIES

SEPTEMBER 19 – OCTOBER 16, 1993



# UNITED STATES MONTHLY CLIMATE SUMMARY

## SEPTEMBER 1993

September opened with widespread showers and thunderstorms covering much of the eastern two-thirds of the country. Heavy rain drenched most areas from Oklahoma to the lower Great Lakes and the Southeast, with storm totals exceeding two inches at many locations. Meanwhile, Hurricane Emily moved rapidly out to sea after buffeting the Outer Banks of North Carolina.

During the first full week of the month, a pair of cold fronts raced quickly southeastward out of Canada, generating scattered showers and thundershowers. Strong northerly winds ushered cold air into the northern two-thirds of the country as temperatures plunged into the thirties and forties from the northern and central Rockies eastward to the northern Atlantic Coast. Dry weather brought relief from long-term wetness to much of the Corn Belt, but farther south, intense thunderstorms inundated the southern Atlantic Coast states with up to eight inches of rain. Summer-like weather dominated the Far West, with temperatures soaring into the nineties through much of the interior.

A powerful cold front ushered chilly Canadian air into the Rockies, Plains, and Mississippi Valley during the middle of September. The system generated the first major snowfall of the season in the northern and central Rockies while subfreezing temperatures penetrated southward into the central Rockies, central High Plains, and portions of the upper Mississippi Valley. Subtropical moisture, partially from the remnants of Pacific Hurricane Lidia, fueled violent thunderstorms in central and eastern Texas. A half-dozen tornadoes raked Texas, with one twister slicing along a 60-mile path in the Fort Worth area and causing more than eight million dollars in damage at Cleburne, according to press reports. Heavy rains inundated the middle Mississippi Valley and the Ozark Plateau, swelling rivers and streams and forcing road closures in Missouri.

During the last full week of September, excessive rains generated flooding in the southern half of Missouri, southeastern Kansas, and northeastern Oklahoma. Over sixteen inches of rain drenched parts of southwestern Missouri in two weeks. The Office of Hydrology reported that the Missouri River crested at 34.9 feet at St. Charles, and serious flooding afflicted areas where levees damaged during previous floods had not yet been repaired. Barge traffic was again shut down along part of the Mississippi River north of St. Louis due to high water and damaged levees. Pittsburg, in southeastern Kansas, was inundated by almost 16 inches of rain in a 24-hour period while the James River at Galena, south of Springfield, MO, rose to 33.5 feet, shattering the previous record of 29.8 feet set in 1943. In addition, the Spring River at Quapaw, OK crested at 46.6 feet, over twice the 20-foot level (flood stage), according to the Office of Hydrology.

As the month ended, violent thunderstorms spawned tornadoes in northern Virginia, Delaware, and eastern Pennsylvania while heavy rains drenched the East and South from the southeastern Plains and lower Mississippi Valley northeastward to the Great Lakes, Northeast, and middle Atlantic coast. Record high temperatures were observed in parts of eastern Texas, Louisiana, and North Carolina.

According to the River Forecast Centers, heavy precipitation (over four inches) was widespread across the eastern half of the nation, with totals exceeding one foot in eastern Oklahoma

and southwestern and central Missouri (page 8). At least twice the normal totals were observed across most of Missouri and portions of adjacent states, where several locations established new September rainfall records (page 12). Above normal precipitation amounts were also recorded in much of central and southern Alaska. Based on preliminary calculations from the National Climatic Data Center (NCDC), only two of the nine regions reported above median precipitation, with the Central and the Northeast reporting the 3<sup>rd</sup> wettest and 17<sup>th</sup> wettest September, respectively, since records began in 1895 (page 9). Of the 48 contiguous states, only 21 observed above median amounts; however, Missouri endured the wettest September in 99 years of record, and six more states (IL, IN, MA, NJ, PA, and WV) had one of the ten wettest such months on record. In addition, the primary Corn and Soybean Belt had the wettest growing season (March – September, as defined by NCDC) ever recorded (page 12).

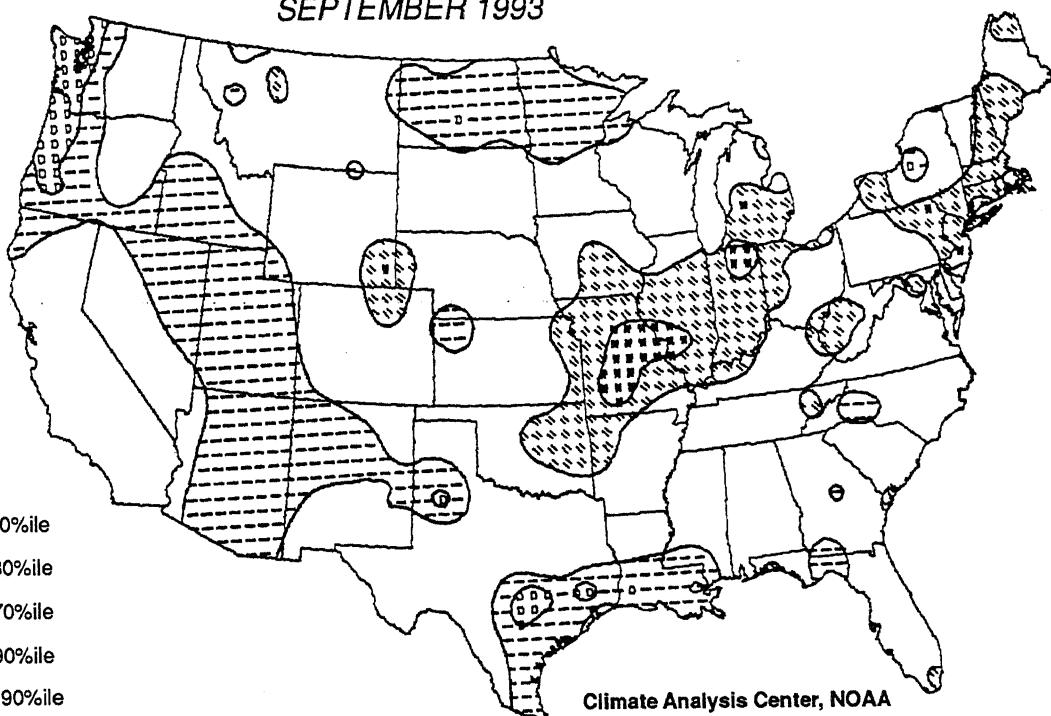
Below normal precipitation prevailed across the most of the United States west of the Continental Divide, along the western and central Gulf Coast, and in the northern Plains (page 8). Most of Hawaii and the Alaskan Panhandle also received subnormal precipitation amounts. Seven of the nine NCDC regions reported submedian totals, with the West and Northwest experiencing the 4<sup>th</sup> and 5<sup>th</sup> driest such month, respectively, in 99 years of record (page 9). Of the 48 contiguous states, 27 reported submedian totals, with Oregon reporting the driest September since 1895. Nevada and Washington reported the 3<sup>rd</sup> driest such month while North Dakota had the 4<sup>th</sup> driest September since records began in 1895. Nationally, the month was the 10<sup>th</sup> driest on record, despite heavy precipitation in the central states.

Unusually cool weather dominated most of the central United States, the Great Lakes, and western and central parts of New England (page 10). Temperatures averaged more than 6°F below normal in portions of Minnesota, Iowa, and Missouri while departures of -4°C or lower prevailed throughout the Plains and western Great Lakes. In addition, temperatures were as much as 3°F below normal across most of interior Alaska. According to NCDC, six of the nine regions reported submedian September temperatures, with the East North Central and Central experiencing the 2<sup>nd</sup> and 9<sup>th</sup> coolest such month, respectively, since records began in 1895 (page 11). The monthly mean temperature was below the median in 32 of the 48 contiguous states, with three states (MI, NE, and WI) reporting the 2<sup>nd</sup> coolest September in 99 years. Eight more states (CO, IL, IN, IA, KS, MN, MO, and OK) had one of the ten coolest such months on record.

In contrast, abnormally warm conditions prevailed in the Far West, the deep South, the mid-Atlantic, and eastern New England (page 10), with monthly departures ranging from +2°F to +4°F. In addition, temperatures averaged as much as 3°F above normal on Hawaii and across southern and southeastern Alaska. Only three regions and sixteen of the 48 contiguous states experienced above median monthly mean temperatures, and no region or state was ranked among the twenty warmest such months in the 99-year historical distribution (page 11). A few locations in the deep South, however, established new September high temperature records as the mercury briefly topped 90°F at some locations (page 12).

## PRECIPITATION PERCENTILES

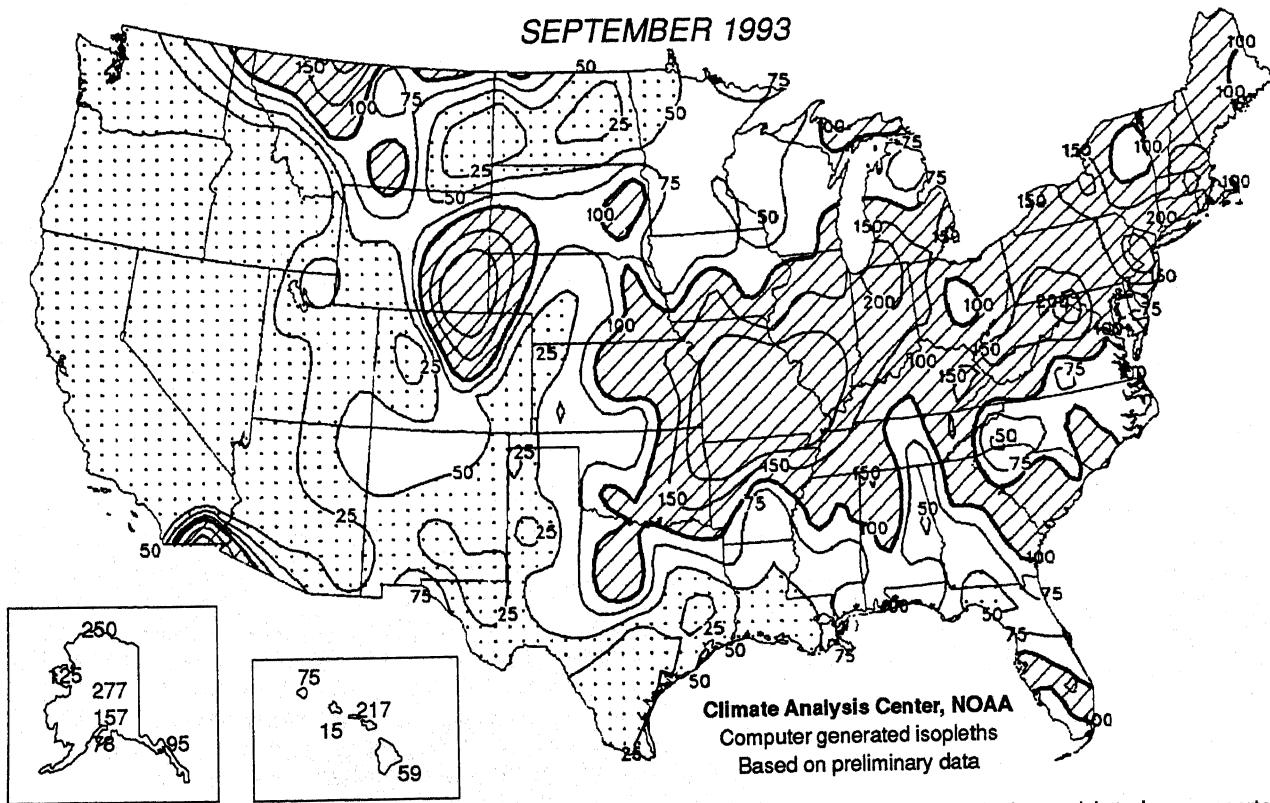
SEPTEMBER 1993



**SEPTEMBER 1993 PRECIPITATION PERCENTILES**, as computed by the Climate Analysis Center. A wet month (>70%ile) was observed across the Corn Belt, the southern Great Lakes, and parts of the Northeast, with totals among the wettest 10% of the historical distribution in parts of Missouri, Illinois, and Indiana. Climatologically significant dryness (<30%ile) was prevalent across the West, the western and central Gulf Coast, and the northern Plains. The Pacific Northwest and scattered parts of Texas reported amounts in the driest 10%ile.

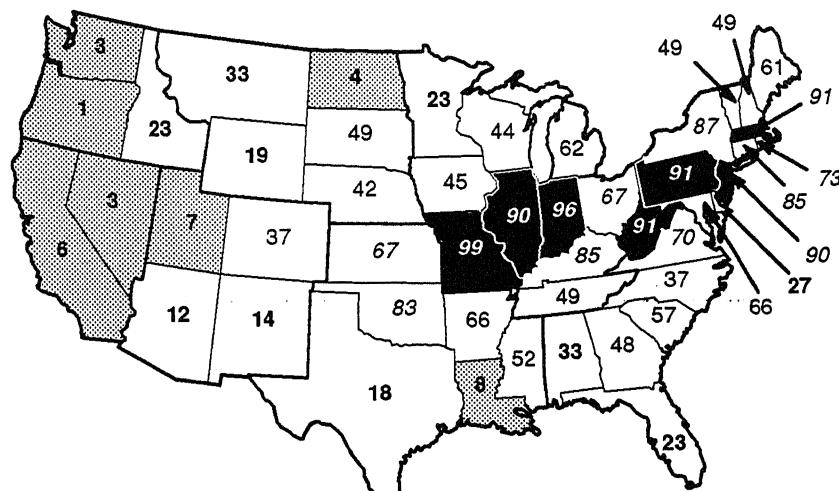
## PERCENT OF NORMAL PRECIPITATION

SEPTEMBER 1993



**SEPTEMBER 1993 PERCENT OF NORMAL PRECIPITATION**. Hatched areas received above normal precipitation, and dotted areas reported under half of normal. Abnormally wet weather dominated the northern and central Rockies, the central Plains, the Great Lakes, and the Northeast during September 1993. Drier than normal conditions covered most of the West, the northern Plains, the southern High Plains, and much of the Gulf Coast.

## HISTORICAL PRECIPITATION RANKINGS BY STATE SEPTEMBER 1993



### LEGEND

- Among the ten driest
- Among the ten wettest
- 1 - 33: DRY
- 34 - 66: NEAR NORMAL
- 67 - 99: WET

Climate Analysis Center, NOAA

Based on preliminary data generated by the National Climatic Data Center

## HISTORICAL PRECIPITATION RANKINGS BY REGION AND NATION SEPTEMBER 1993



### LEGEND

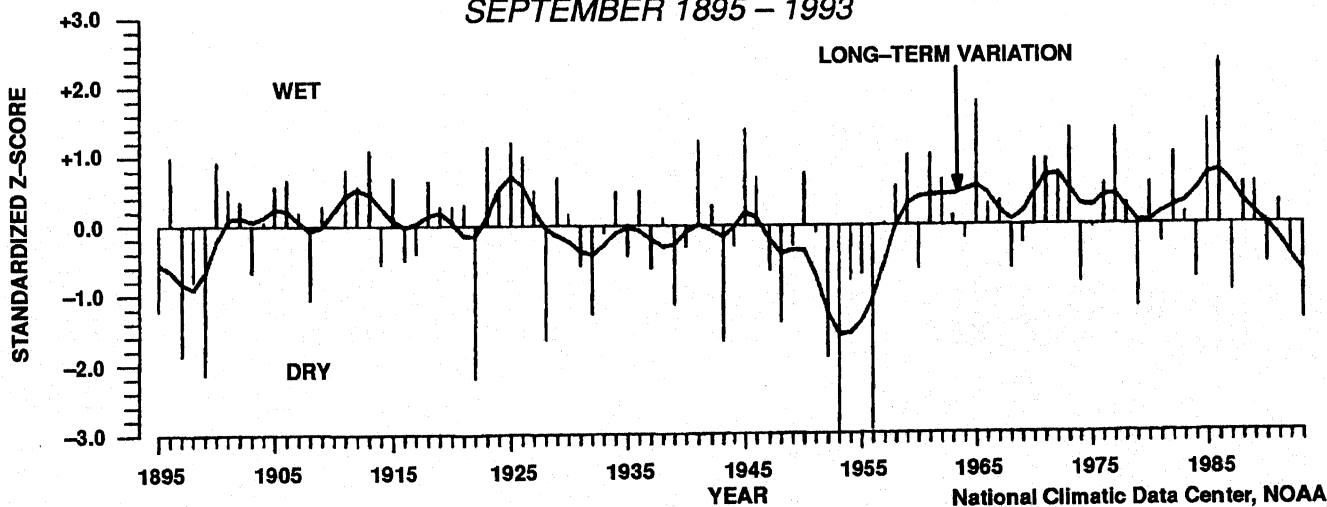
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- 34 - 66: NEAR NORMAL
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Climate Analysis Center, NOAA

Based on preliminary data generated by the National Climatic Data Center

This chart depicts the ranking of the specific parameter, as measured during the period indicated, with respect to all other such periods on record since 1895.

## U. S. NATIONAL NORMALIZED PRECIPITATION INDEX SEPTEMBER 1895 - 1993

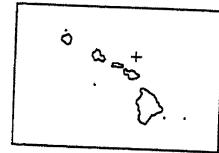
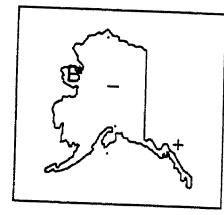


National Climatic Data Center, NOAA

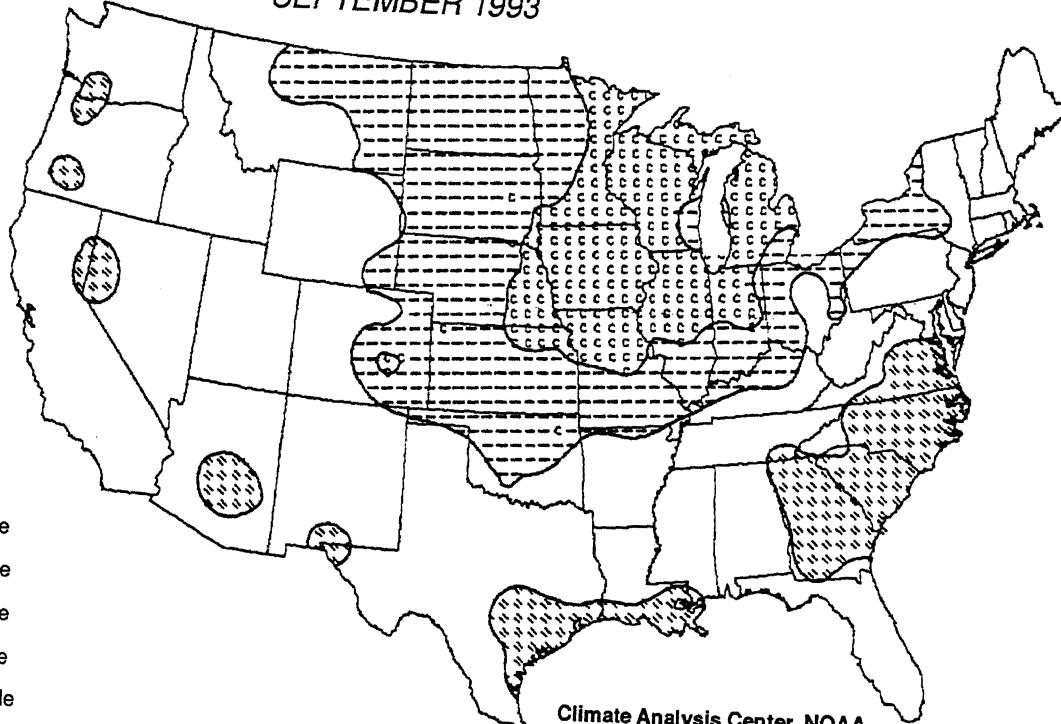
**NATIONAL MEAN SEPTEMBER 1895-1993 PRECIPITATION INDEX**, as computed by the National Climatic Data Center. September 1993 ranked as the 10<sup>th</sup> driest on record despite heavy rains in the central states. This index takes local normals into account, so that regions with large precipitation amounts do not dominate the index value.

## TEMPERATURE PERCENTILES

SEPTEMBER 1993



-  C less than 10%ile
-  - 10%ile to 30%ile
-  . 30%ile to 70%ile
-  + 70%ile to 90%ile
-  H more than 90%ile

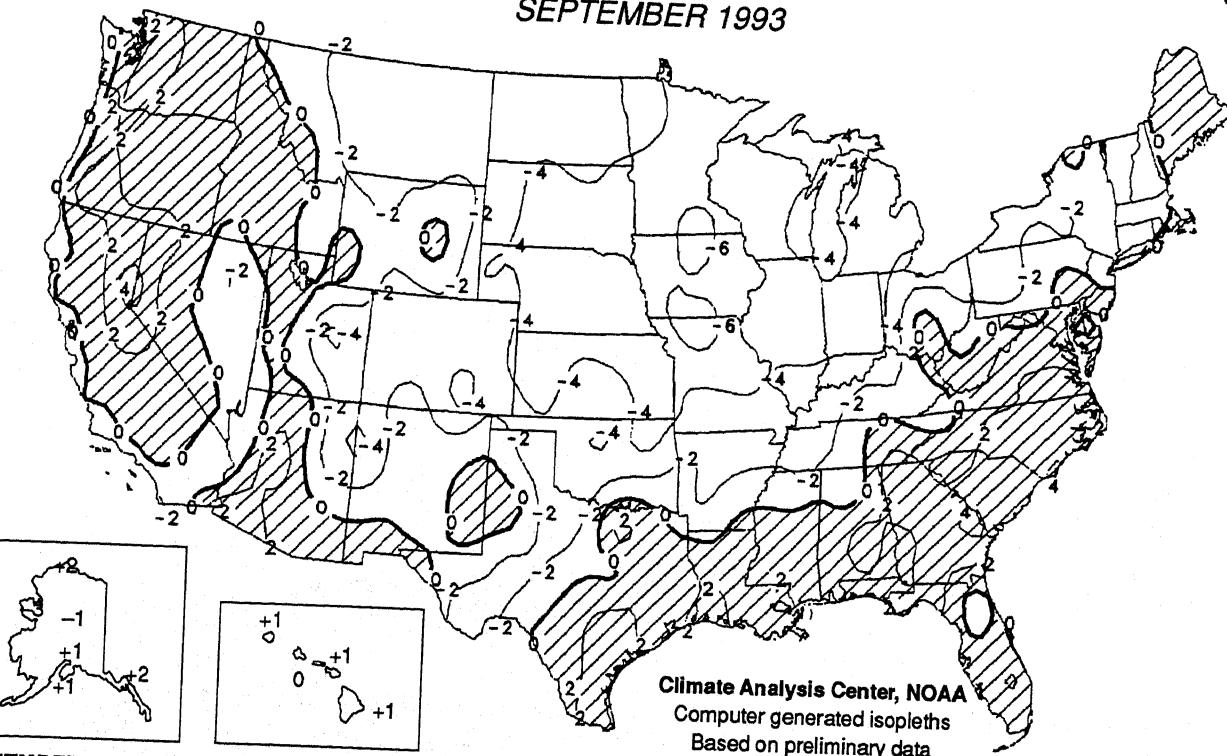


Climate Analysis Center, NOAA

**SEPTEMBER 1993 TEMPERATURE PERCENTILES**, as computed by the Climate Analysis Center. Unusually cool weather (<30%ile) dominated much of the central United States from the Rockies eastward to the Great Lakes, with monthly mean temperatures among the coldest 10% of the 1961–1990 historical distribution across the Corn Belt and western Great Lakes. In contrast, abnormally warm conditions (>70%ile) were observed in the mid-Atlantic, the Southeast, the western Gulf Coast, and scattered parts of the Far West.

## DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F)

SEPTEMBER 1993

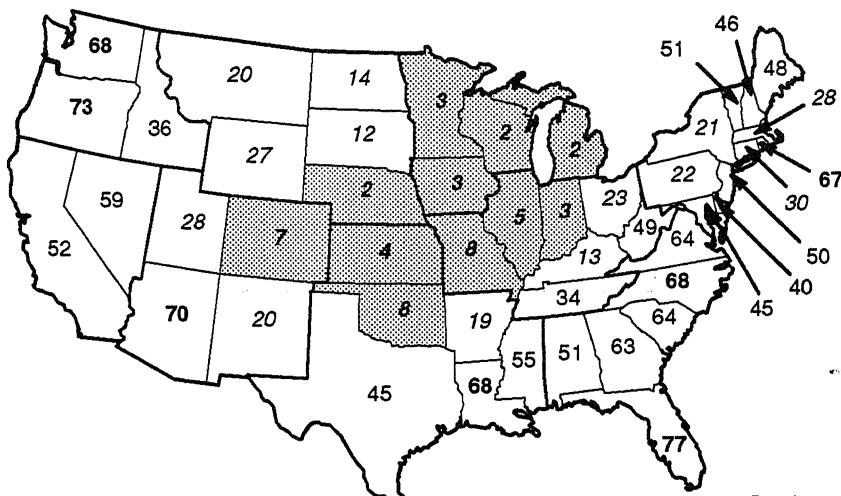


Climate Analysis Center, NOAA  
Computer generated isopleths  
Based on preliminary data

**SEPTEMBER 1993 DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F)**. Shaded areas experienced above normal temperatures. Below normal temperatures covered most of the Rockies, the Plains, the Great Lakes, and western New England, with temperatures averaging more than 6°F below normal in parts of Missouri, Iowa, and Minnesota. In contrast, unusually high temperatures prevailed in the Great Basin, the mid-Atlantic, and the South, with monthly departures approaching +4°C in western Nevada and portions of the Carolinas.

# HISTORICAL TEMPERATURE RANKINGS BY STATE

## SEPTEMBER 1993



**LEGEND**

 *Among the ten coldest*  
 **Among the ten warmest**

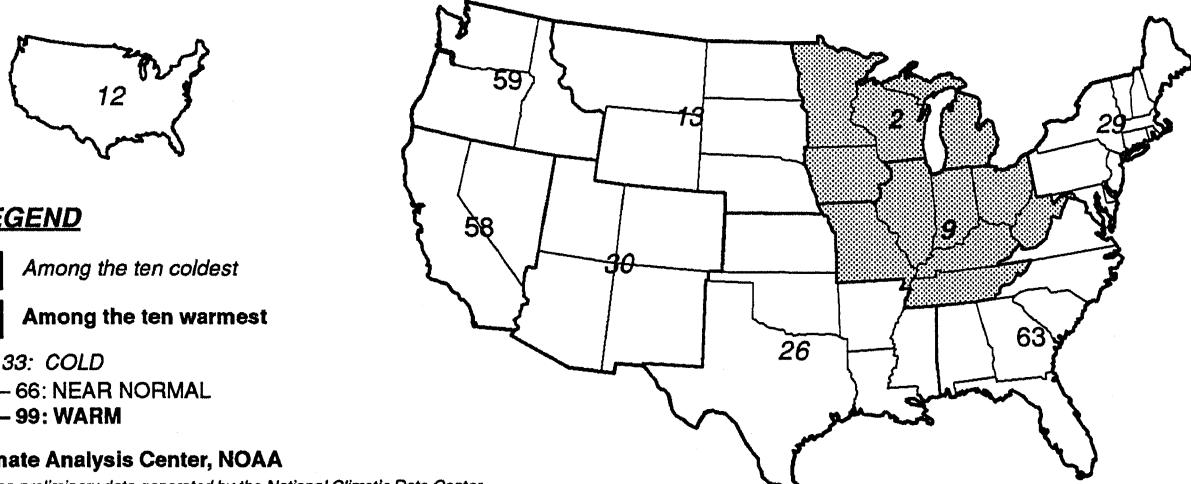
Climate Analysis Center, NOAA

Based on preliminary data generated by the National Climatic Data Center

**This chart depicts the ranking of the specific parameter, as measured during the period indicated, with respect to all other such periods on record since 1895.**

## HISTORICAL TEMPERATURE RANKINGS BY REGION AND NATION

SEPTEMBER 1993



**LEGEND**

- Among the ten coldest
- Among the ten warmest

1 - 33: COLD  
34 - 66: NEAR NORMAL  
67 - 99: WARM

Climate Analysis Center, NOAA

*Based on preliminary data generated by the National Climatic Data Center*

**This chart depicts the ranking of the specific parameter, as measured during the period indicated, with respect to all other such periods on record since 1895.**

## II. S. NATIONAL TEMPERATURE

TABLE 1. RECORD SEPTEMBER PRECIPITATION

STATION	TOTAL (IN)	NORMAL (IN)	PCT. OF NORMAL	RECORD TYPE	RECORDS BEGAN
SPRINGFIELD, MO	17.46	4.77	366.0	HIGHEST	1946
COLUMBIA, MO	12.06	3.93	306.9	HIGHEST	1961
MC GRATH, AK	6.21	1.98	313.6	HIGHEST	1941
PORTLAND, OR	0.00	1.75	0.0	LOWEST	1871
EUGENE, OR	0.00	1.67	0.0	LOWEST	1951
WINSLOW, AZ	0.00	0.91	0.0	LOWEST	1947
PENDLETON, OR	0.00	0.59	0.0	LOWEST	1935
SACRAMENTO, CA	0.00	0.37	0.0	LOWEST	1851
LOS ANGELES, CA	0.00	0.31	0.0	LOWEST	1936
SANTA MARIA, CA	0.00	0.30	0.0	LOWEST	1947

NOTE: Trace precipitation is considered ZERO precipitation. Stations with no precipitation are only included if normal precipitation is 0.25 inches or more.  
\*\*\*\* - Percent of normal not calculable.

TABLE 2. RECORD SEPTEMBER AVERAGE TEMPERATURES

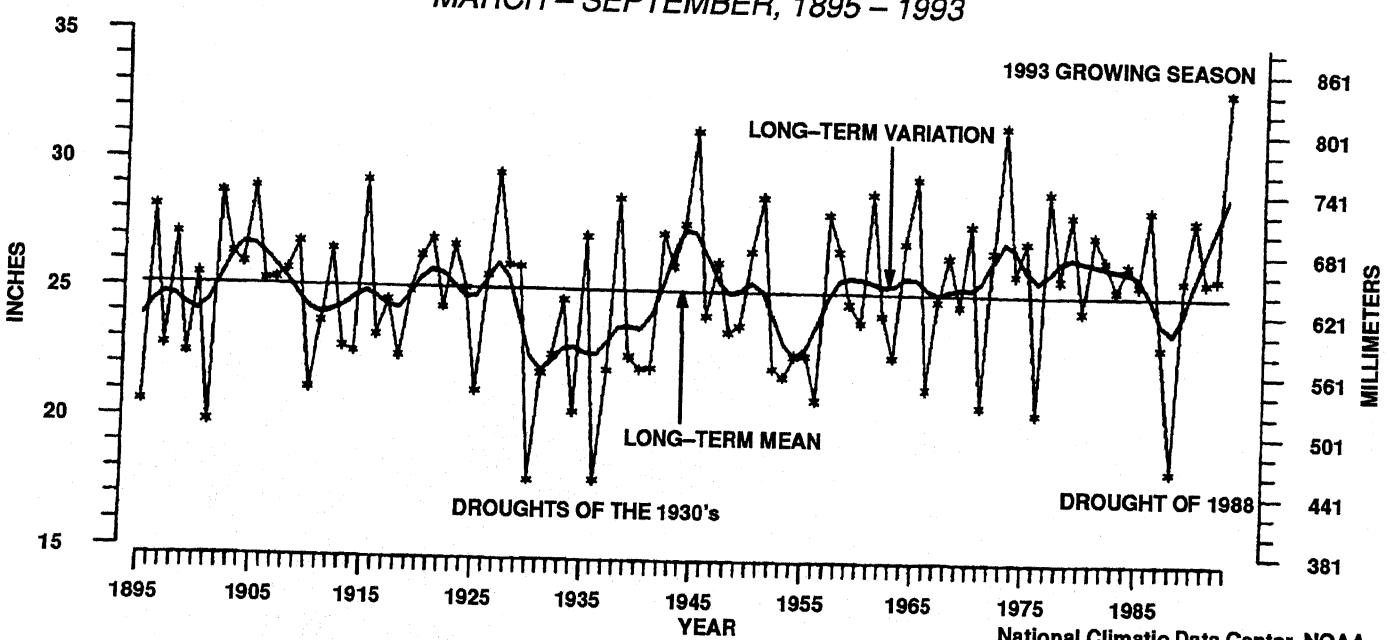
STATION	DEPARTURE (°F)	AVERAGE (°F)	NORMAL (°F)	RECORD TYPE	RECORDS BEGAN
DES MOINES, IA	-4.3	59.2	63.5	LOWEST	1878
CONCORDIA, KS	-4.7	62.6	67.3	LOWEST	1886
FLINT, MI	-5.0	56.3	61.3	LOWEST	1951
CHICAGO/O'HARE, IL	-5.2	59.2	64.4	LOWEST	1959
LA CROSSE, WI	-5.2	56.5	61.7	LOWEST	1952
ROCHESTER, MN	-5.6	53.6	59.2	LOWEST	1961

TABLE 3. RECORD SEPTEMBER EXTREME TEMPERATURES

STATION	EXTREME (°F)	DATE OCCURRED	RECORD TYPE	RECORDS BEGAN
APALACHICOLA, FL	97	SEPTEMBER 26	HIGHEST	1930
LAKE CHARLES, LA	97	SEPTEMBER 1	HIGHEST	1962
LIHUE, KAUAI, HI	90	SEPTEMBER 26	HIGHEST	1950
LEXINGTON, KY	34	SEPTEMBER 30	LOWEST	1945
CINCINNATI, OH	31	SEPTEMBER 30	LOWEST	1948
ALPENA, MI	25	SEPTEMBER 30	LOWEST	1960
SAULT STE. MARIE, MI	25	SEPTEMBER 30	LOWEST	1941
MARQUETTE, MI	24	SEPTEMBER 30	LOWEST	1979

## PRIMARY CORN AND SOYBEAN BELT PRECIPITATION

MARCH - SEPTEMBER, 1895 - 1993



PRIMARY CORN AND SOYBEAN BELT MARCH-SEPTEMBER 1895-1993 PRECIPITATION, as computed by the National Climatic Data Center. March - September 1993 was the wettest growing season (as defined by NCDC) on record for the primary Corn and Soybean Belt.

# EL NIÑO / SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC ADVISORY 93/09

## ISSUED BY

### DIAGNOSTICS BRANCH CLIMATE ANALYSIS CENTER, NMC

October 13, 1993

Sea surface temperature (SST) anomalies less in all three Niño regions during September (Fig. 1), which is a reversal of the trend noted between July and August. In September, five SST anomalies greater than  $1.5^{\circ}\text{C}$  were noted along the equator at the date line, and the warmest water in the tropical Pacific ( $30^{\circ}\text{C}$ ) was noted in this region (Fig. 2). In the past, this latter feature has been a good indicator of a developing warm episode.

All atmospheric indices during September were consistent in indicating a continuation of a warm episode conditions. The low-level easterlies remained weaker than normal, as positive sea level pressure (SLP) anomalies dominated the region of Indonesia and negative SLP anomalies prevailed in the eastern tropical Pacific. These features persisted for more than three years. During this period sea surface temperature (SST) anomalies in the Niño 4 region have remained positive (Fig. 1), and the Southern Oscillation Index (SOI) has been predominantly negative (Fig. 3).

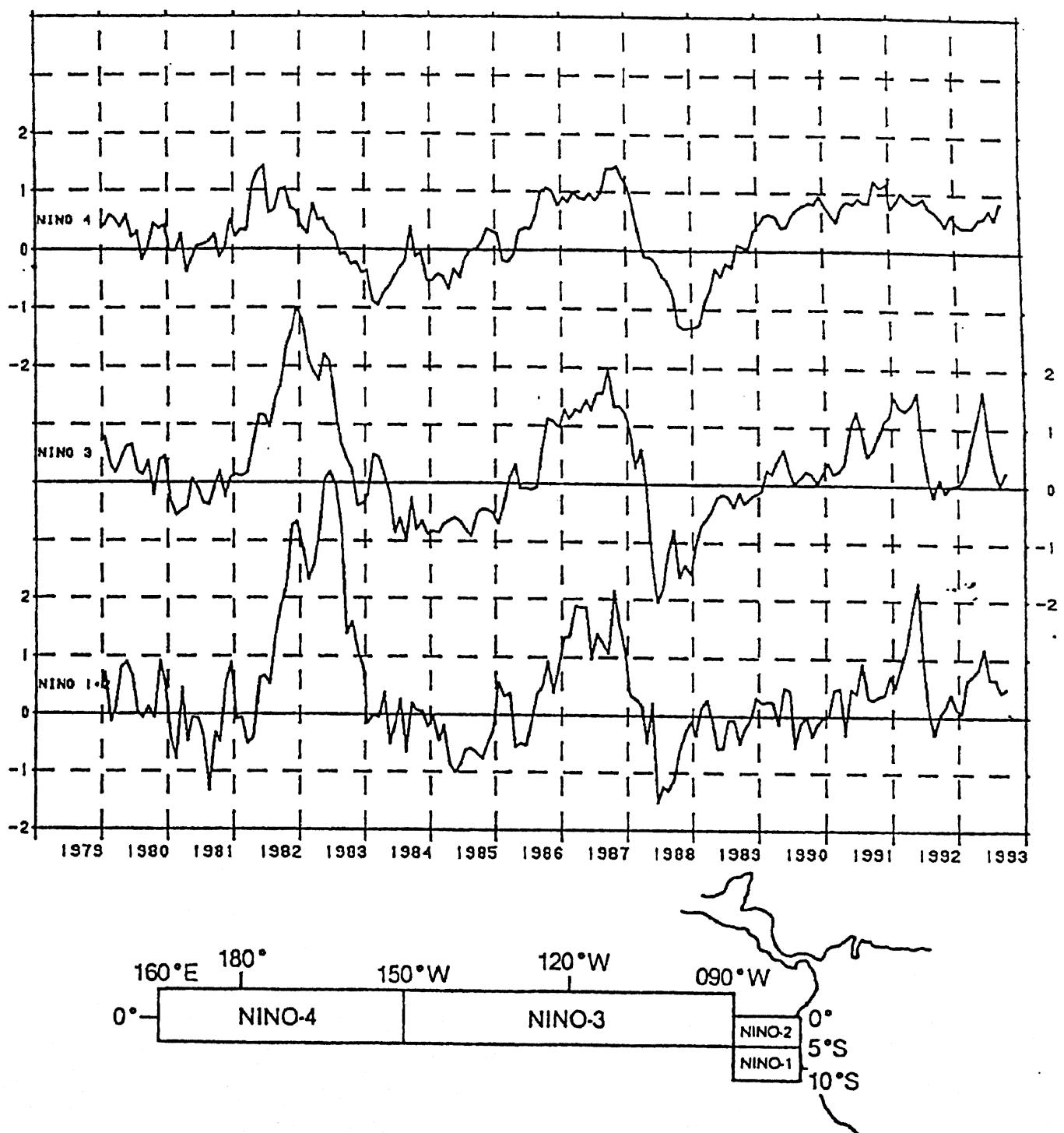
During the last few months the oceanic thermocline has deepened in the central equatorial Pacific. In September positive depth anomalies of approximately 20 m were observed near  $140^{\circ}\text{W}$ . The rate of deepening increased in September and positive depth anomalies progressed eastward to  $160^{\circ}\text{W}$ . This evolution is likely associated with an

eastward-propagating oceanic Kelvin wave initiated in August as the low-level equatorial easterlies weakened substantially throughout the tropical Pacific. This Kelvin wave should reach the South American coast during October.

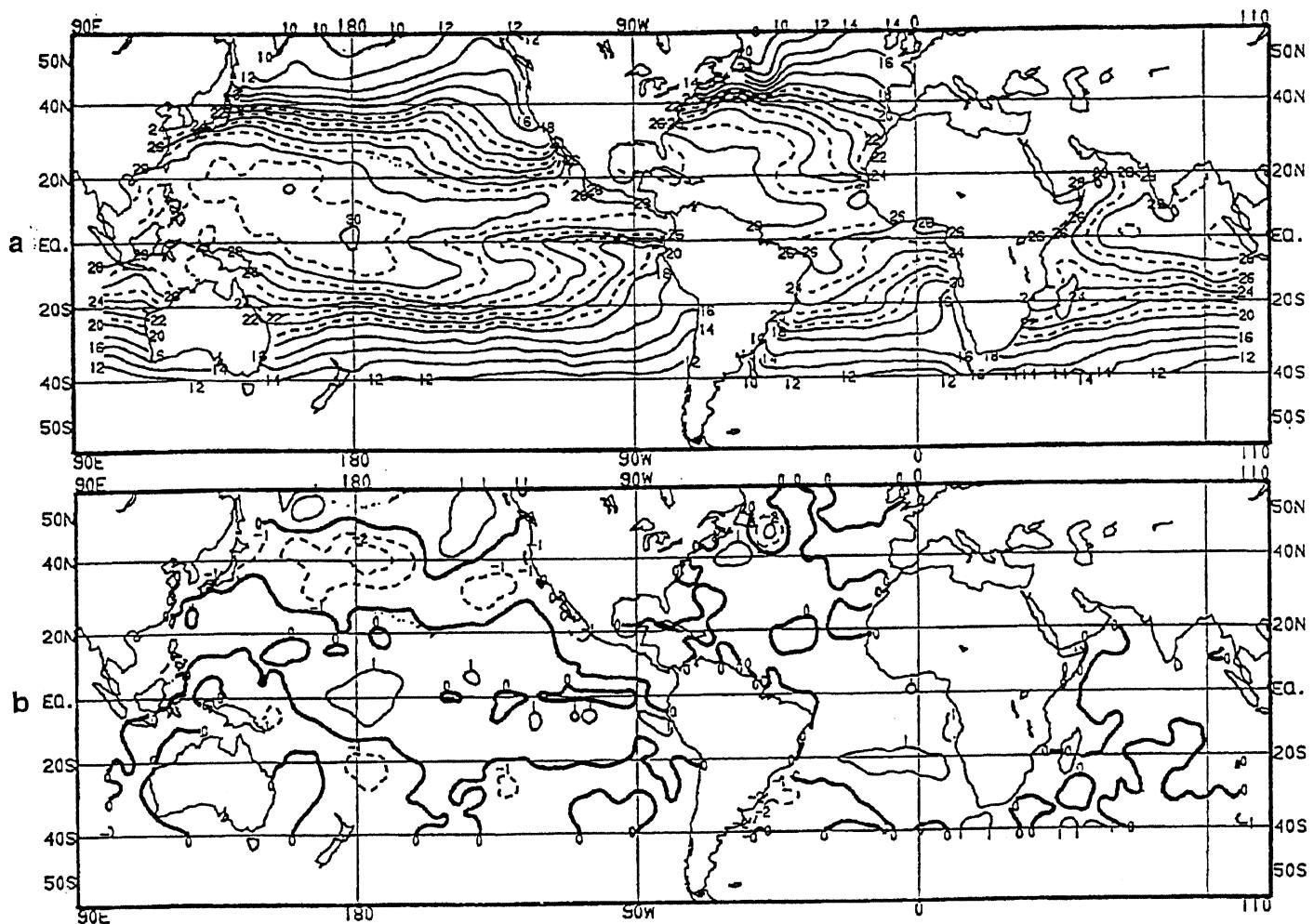
The deepening of the thermocline in the central equatorial Pacific, together with continued weaker than normal low-level easterlies, increased positive SST anomalies and negative values of the SOI, indicate a strong potential for the redevelopment of mature warm episode conditions during the next several months. Only the statistical canonical correlation analysis (CCA) forecasts support this redevelopment. Both the NMC coupled model and the Cane and Zebiak model forecasts indicate near or slightly cooler than normal conditions through early 1994.

In the past, October and November have proven to be critical months; they are often the start of the warm episode. The development of the warm episode is often preceded by an increase in the frequency and intensity of convection in the central and eastern tropical Pacific.

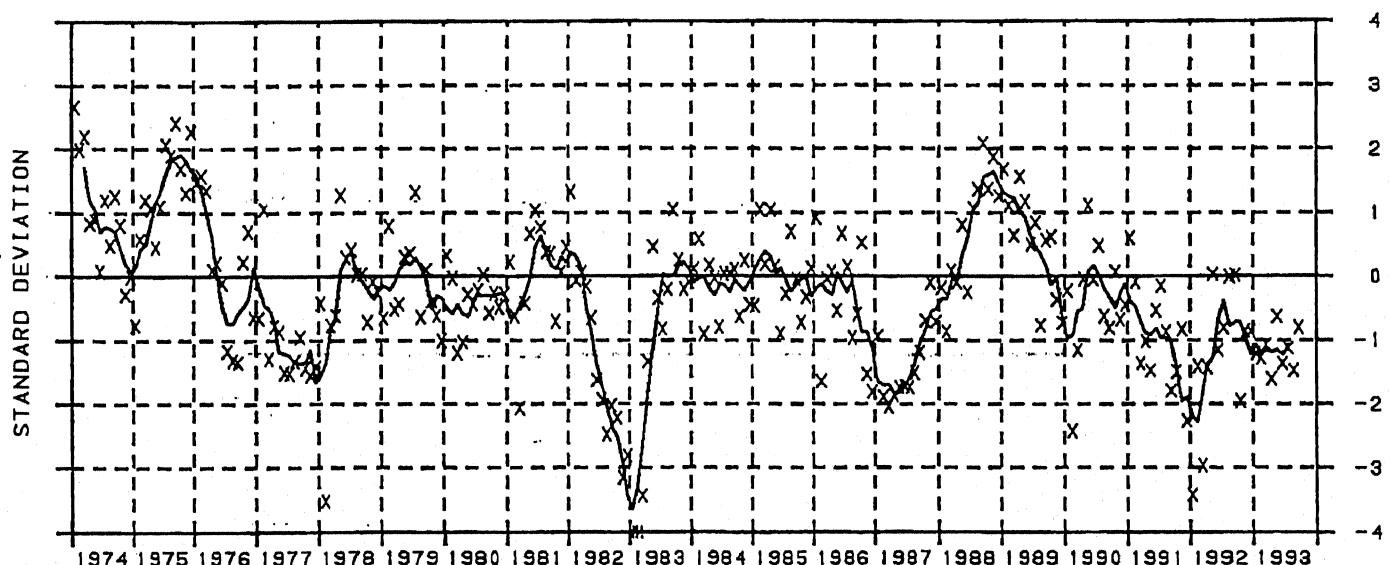
These months usually leads to the development of persistent global atmospheric circulation anomalies that last through portions of the northern winter and spring seasons. The persistence of anomalously warm water in the central equatorial Pacific (Niño 4 region) during the next two months increases the likelihood that mature warm episode conditions will redevelop by the end of 1993.



**FIGURE 1.** Equatorial Pacific sea surface temperature anomaly indices ( $^{\circ}\text{C}$ ) for the areas indicated in the figure. Niño 1+2 is the average over the Niño 1 and Niño 2 areas. Anomalies are computed with respect to the COADS/ICE climatology (Reynolds 1988, *J. Climate*, 1, 75–86).



**FIGURE 2.** Sea surface temperature, a) mean (blended analysis) and b) anomaly, for September 1993. Mean SST contour interval is  $2^{\circ}\text{C}$ . Temperatures  $> 20^{\circ}\text{C}$  are contoured every degree with odd contours dashed. Anomalies are computed as departures from the COADS/ICE climatology (Reynolds 1988, *J. Climate*, 1, 75–86). Anomaly contour interval is  $1^{\circ}\text{C}$  and negative contours are dashed.



**FIGURE 3.** Five-month running mean of the difference between the standardized sea level pressure anomalies at Tahiti and Darwin (Tahiti minus Darwin). Values are standardized by the mean annual standard deviation. The "X"s indicate individual monthly means.

# ATMOSPHERIC AND OCEANIC INDICES

DATE	SLP ANOMALIES	TAHITI-DARWIN SOI		PACIFIC 850 MB ZONAL WIND INDICES		PACIFIC 200 MB ZONAL WIND INDEX		OLR INDEX	PACIFIC SST			
		TAHITI	DARWIN	5N-5S 135E-180	5N-5S 175W-140W	5N-5S 135W-120W	5N-5S 165W-110W		NINO 1+2 0-10S 90W-80W	NINO 3 5N-5S 150W-90W	NINO 3 5N-5S 150W-90W	NINO 4 5N-5S 160E-150W
SEP 93	0.2	1.5	-0.8	-0.1	-0.7	-1.4	-0.6	-0.8	0.5	21.1	0.3	25.0
AUG 93	0.1	2.5	-1.5	-0.9	-0.7	-1.0	-0.1	-0.6	0.4	21.4	0.0	25.1
JUL 93	-1.1	0.7	-1.1	0.0	0.0	0.2	0.4	-1.1	0.7	22.3	0.3	25.9
JUN 93	-0.6	1.6	-1.4	-0.6	-1.0	-1.4	-1.0	-1.5	0.7	23.5	0.8	27.2
MAY 93	0.5	1.5	-0.6	-0.5	-0.9	-1.2	-1.3	-1.8	1.2	25.3	1.7	28.4
APR 93	-0.6	2.0	-1.6	-1.7	-1.0	-0.8	-1.0	-2.4	0.8	26.3	1.2	28.5
MAR 93	0.9	2.7	-1.1	-1.5	-0.4	-0.2	0.0	-0.9	0.7	26.9	0.8	27.6
FEB 93	-1.9	0.0	-1.3	-1.4	-1.0	-0.5	-1.2	-1.8	0.6	26.3	0.3	26.6
JAN 93	-1.3	0.6	-1.2	0.0	-0.9	-1.0	-1.1	-0.7	0.1	24.4	0.1	25.5
DEC 92	-1.3	0.0	-0.9	-0.6	-1.2	-0.9	0.0	-1.5	0.1	22.7	0.0	25.1
NOV 92	-0.6	0.8	-0.9	-0.7	-1.2	-1.5	-0.4	-0.8	0.4	21.9	0.0	24.9
										0.5	0.5	28.7

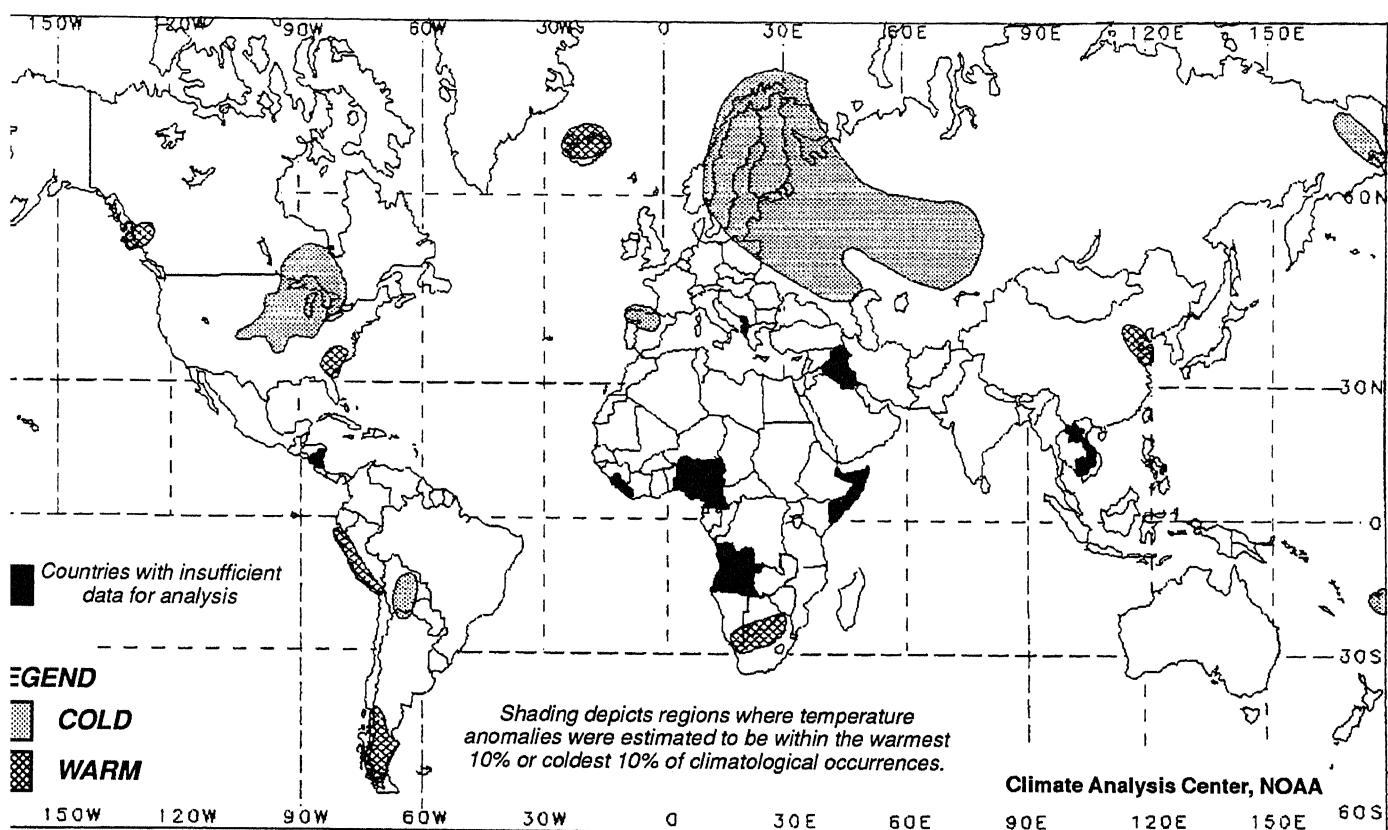
\* PRELIMINARY

\*\* REVISED

**TABLE T1.** Atmospheric and SST index values for the most recent 12 months. Atmospheric indices are standardized by the mean annual standard deviation except for the Tahiti and Darwin SLP anomalies which are in mb. SST indices (anomalies and means) are in degrees Celsius. Note that positive (negative) values of the 200 mb Zonal Wind Index imply westerly (easterly) anomalies; positive (negative) values of the 850 mb Zonal Wind Indices imply easterly (westerly) anomalies.

## MONTHLY GLOBAL TEMPERATURE ANOMALIES

SEPTEMBER 1993

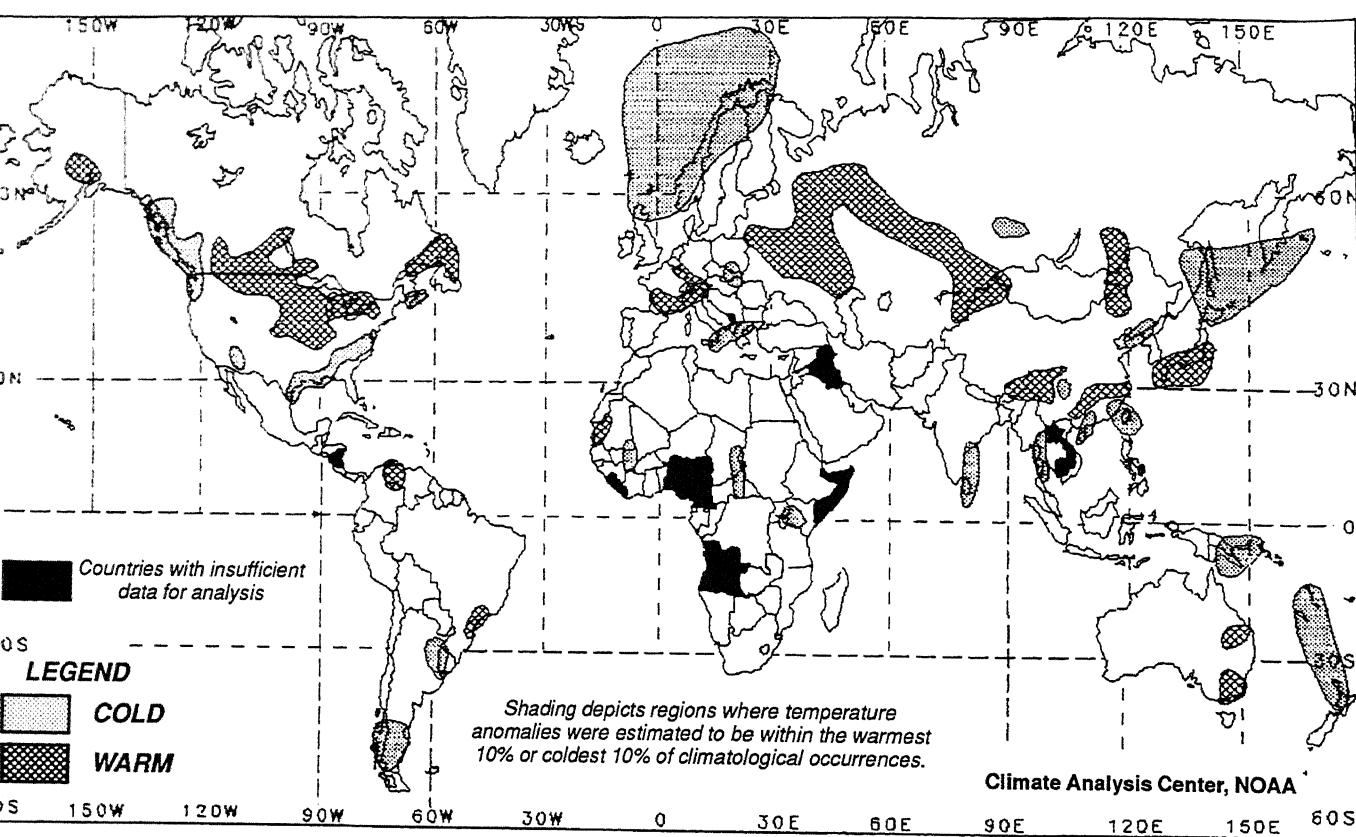


## MONTHLY GLOBAL PRECIPITATION ANOMALIES

SEPTEMBER 1993

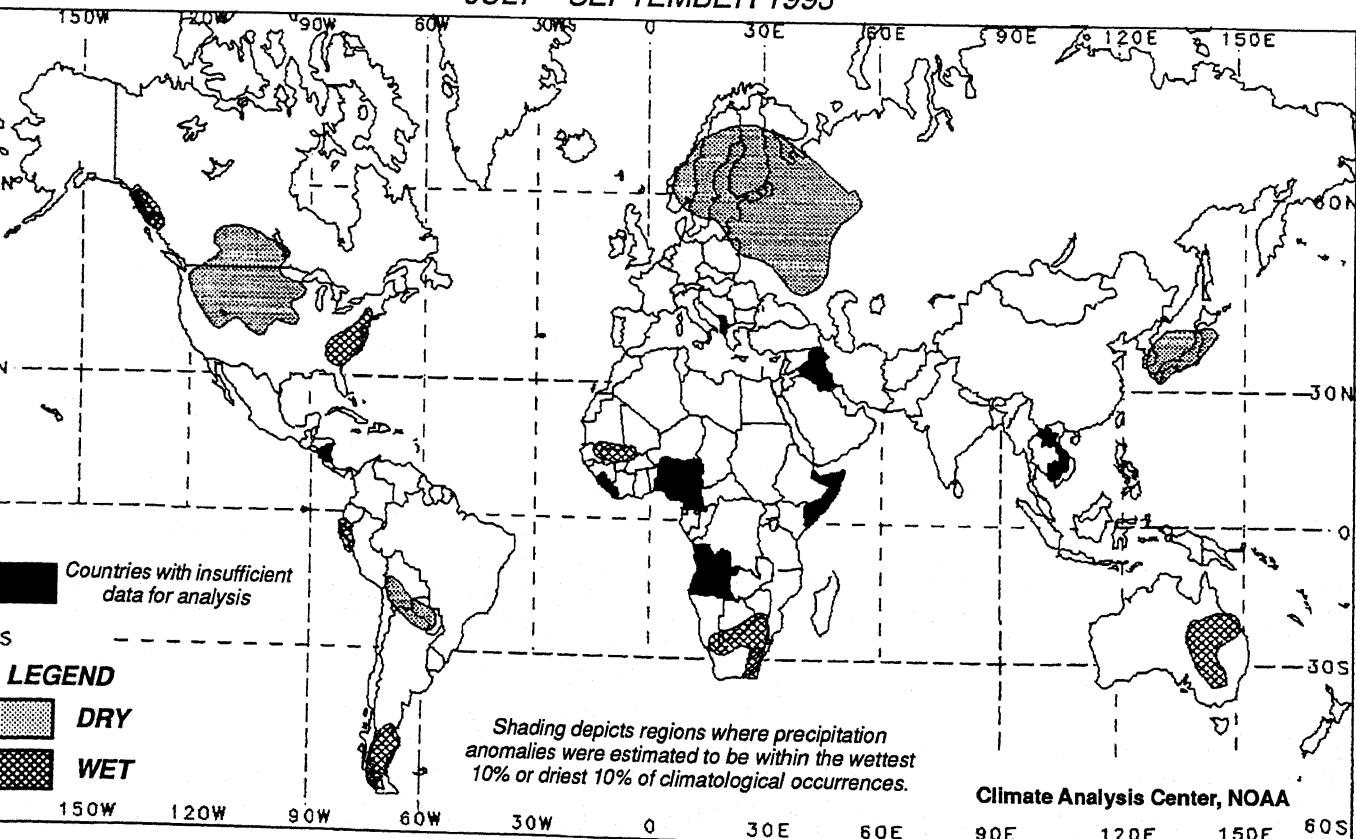
## THREE-MONTH GLOBAL TEMPERATURE ANOMALIES

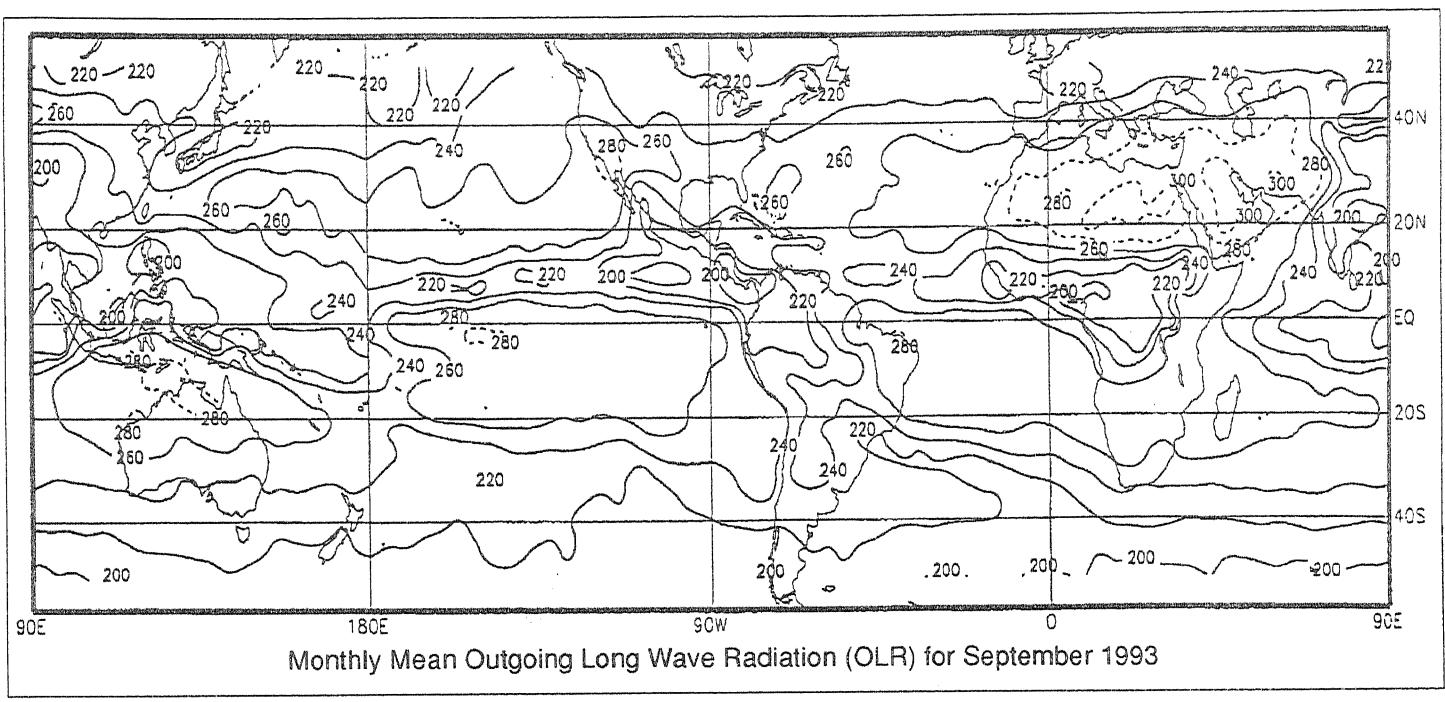
JULY – SEPTEMBER 1993



## THREE-MONTH GLOBAL PRECIPITATION ANOMALIES

JULY – SEPTEMBER 1993





### EXPLANATION

The mean monthly outgoing long wave radiation (OLR) as measured by the NOAA-9 AVHRR IR window channel by NESDIS/SRL (top). Data are accumulated and averaged over  $2.5^{\circ}$  areas to a  $5^{\circ}$  Mercator grid for display. Contour intervals are  $20 \text{ Wm}^{-2}$ , and contours of  $280 \text{ Wm}^{-2}$  and above are dashed. In tropical areas (for our purposes  $20^{\circ}\text{N} - 20^{\circ}\text{S}$ ) that receive primarily convective rainfall, a mean OLR value of less than  $200 \text{ Wm}^{-2}$  is associated with significant monthly precipitation, whereas a value greater than  $260 \text{ Wm}^{-2}$  normally indicates little or no precipitation. Care must be used in interpreting this chart at higher latitudes, where much of the precipitation is non-convective, or in some tropical coastal or island locations, where precipitation is primarily orographically induced. The approximate relationship between mean OLR and precipitation amount does not necessarily hold in such locations.

The mean monthly outgoing long wave radiation anomalies (bottom) are computed as departures from the 1979 – 1988 base period mean. Contour intervals are  $15 \text{ Wm}^{-2}$ , while positive anomalies (greater than normal OLR, suggesting less than normal cloud cover and/or precipitation) are dashed and negative anomalies (less than normal OLR, suggesting greater than normal cloud cover and/or precipitation) are solid.

